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Maine Agricultural Experiment Station

ORONO

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STUDIES ON BEAN BREEDING. I. STANDARD TYPES OF YELLOW EYE BEANS.

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BULLETIN 239.

STUDIES ON BEAN BREEDING. I. STANDARD TYPES OF YELLOW EYE BEANS.[1]

By Raymond Pearl and Frank M. Surface.

Historical.

Several years ago the Experiment Station began some breeding work with beans. The immediate problem for which the work was undertaken was to procure true-breeding strains of Yellow Eye beans. A great deal of difficulty has been experienced by bean growers in securing strains which would come even reasonably true to seed. In spite of careful seed selection for many years strains of these beans often continue to throw small numbers of black, solid yellow, mottled or white beans every year. Many of the large growers complain that in order to secure a good price for their crop it is necessary to hand-pick their beans every year.

At the time our work was started it was believed that it would be a relatively simple matter to secure pure-breeding strains but our experience has shown that this is not the case. It has been generally supposed that the bean flower is normally self-fertilized; that is, that the pistil or female portion of the flower is fertilized by pollen from the same blossom. It was believed that this fertilization always takes place before the blossom opens. Three years ago we found that this is not *always* the case, but that cross-pollination could be, and under our conditions often was, brought about by bumble-bees (*Bombus* sp.).

If one watches a large bumble-bee working in a bean field

[1]Papers from the Biological Laboratory, Maine Agricultural Experiment Station, No. 84.

it will be seen that when he lights on the lower petals of the flower the long pistil is forced out until it touches his body. This pistil is covered with pollen from its own flower and some of this is rubbed onto the bee's body. When he visits the next flower the operation is repeated and some of the pollen from the first flower may be left on the pistil of the second. Where more than one kind of beans are grown in the same or adjoining fields they are almost certain to be mixed. The mixing is all done by the large bumble-bees since the honey bees are too small to trip the petals and force out the pistil.

For this reason it has been necessary to carry on the bean breeding under other conditions. In 1913 there was built at Highmoor Farm a bean cage 25 x 50 feet which was enclosed on both top and sides with screen wire. This effectually excludes all insects which might cross-pollinate the bean flowers.

By this means it will be possible to secure strains which will breed true to all their characters. However, this matter has greatly delayed the bean breeding work of the Station. It is now necessary to test each strain several years inside this cage to find whether it is breeding true or not. When this has been ascertained the most promising strains will be multiplied in isolated plots and the seed offered to the growers of the State. In order to maintain such a strain pure it will be necessary for the grower to plant only one kind of bean or at least to have the different kinds so separated that there will be no danger of crossing by the bumble-bees.

One of the first difficulties which arose in connection with this breeding work was the absence of any standard for the different classes of yellow eye beans. Inquiries among several of the large bean growers of the State showed that in the majority of cases each man had a different idea of the correct type for the Old Fashioned or the Improved Yellow Eye bean. Further inquiry among the dealers, both in and out of the State, showed that not only were these men not united on the question of type, but that often their ideas were quite different from those of the growers.

Obviously such a condition of affairs is not conducive to the best interests of the bean growers. For this reason it seemed that the first thing to do was to attempt to establish standard types for these classes of beans. If these types are accepted

by the dealers, and the growers will direct their efforts towards the production of beans of the desired types, it will add much to the bean growing industry of the State.

With a knowledge of these facts, the Experiment Station Council in 1912 passed a resolution requesting the Station to coöperate with the State Department of Agriculture, the Maine Seed Improvement Association and the Boston Chamber of Commerce, looking towards the establishment of standard types of Maine yellow eye beans.

During the past three years correspondence has been carried on with many of the growers and dealers within the State in order to learn their ideas regarding these varieties. In addition, personal conferences have been held with members of the Boston Chamber of Commerce and particularly with several of the large bean dealers in Boston.

Through these efforts definite ideas have been obtained as to what the growers regard as typical of these varieties. Also what is of still more importance, we have learned the types which the dealers want and for which they are willing to pay the highest prices.

In the following pages the information obtained in these ways will be discussed. A standard type for each of the classes of beans dealt with will be proposed. In preparing these standards we have kept foremost in mind the demands of the market. It is obviously useless to develop a type of bean for which there is and can be no market. In the second place we have aimed to establish a type which the breeder can easily produce and maintain.

In doing this it has not always been possible to include the ideas of local growers. For these reasons there will undoubtedly be some criticism of these standards. This would obviously occur whatever type is selected for a standard. These standard types have been selected after much careful study on our part. However, not being content with our own judgment in the matter, we have sent the manuscript and figures of this bulletin to the principal wholesale dealers and jobbers in beans in Boston for criticism. The final results embody their suggestions, and the standards here proposed are acceptable to them. Consequently if the growers in the State will aim to produce beans of these types they may be assured that their

beans will find a ready market. Further, if a large portion of the growers will unite in the production of such Maine standard types it will not be long until the fact is recognized in the large markets. If it comes to be known that Maine is producing a uniform standard type of Improved Yellow Eye beans, for example, there will be a much greater demand for Maine grown beans of this kind.

Bean Production in Maine.

Before discussing the standard types proposed it will be worth while to consider briefly the relative importance of the bean crop in this State. According to the last United States census (1910) Maine ranked fifth among the states in the production of dry edible beans. Some idea of what this means may be gained from the following figures taken from the Census Report (Vol. 5). The figures give the production in 1909 of the five largest bean producing states.

Michigan	5,282,511 bus.
California	3,328,218 "
New York	1,681,506 "
Wisconsin	154,570 "
Maine	87,565 "

From this table it is seen that although Maine occupies fifth place it is very far below the remaining four states in absolute production. We further learn from the Census Report that the production of beans in Maine has decreased from 137,290 bushels in 1899 to 87,565 bushels in 1909. It is not our purpose to analyze the causes of this decrease of over 36 per cent. Our inquiries and observations however indicate that a considerable portion of this decrease is due to inability to maintain pure breeding strains. It has been the custom of many growers to plant several varieties in the same field. Our experiments have shown that under such conditions many of the beans will be cross-pollinated by the bumble-bees. The results of this crossing are not visible the first year, but when such seed is planted the second year it will break up into all sorts of types. Even if no further crossing took place, it would require several years selection for the grower to obtain pure

breeding seed again. But new crossing will take place every year and consequently in spite of rigid selection the beans become more and more mixed each year. To our knowledge the bumble-bees have in this way put more than one large grower out of business.

The first thing that the bean grower must realize is that his seed must be produced in an isolated field where there is little opportunity for crossing with other varieties. In Circular No. (510-5-15) of this Station we have attempted to give some directions which will aid the grower in producing and maintaining pure breeding strains. But in order to do this successfully the grower must limit himself to one, or at the most two varieties. Each of these must be grown in fields separated not only from his own but from his neighbors' beans.

There seems to be no reason why the bean crop should not become a very important one in Maine. Most of the varieties of bush beans will easily mature in from 90 to 100 days. For the southern and central parts of the State it is a practically sure crop so far as frost is concerned. The return per acre compares very favorably with that of the cereals. Further the bean plant is a legume, belonging to the same general family to which the clover belong. The great benefit brought to soils by cropping with clovers lies in the ability of these plants to gather nitrogen from the air through the agency of the bacteria living in the nodules on the roots. The bean plant also collects nitrogen from the air by similar means. Thus at the same time that a profitable crop is being produced, the soil is being enriched by the addition of nitrogen. For a large portion of the State beans are an excellent crop to use in the rotation.

Yellow Eye Beans.

The most popular varieties of beans grown in the State are the so-called Yellow Eye. Of these there are two principal classes, the Improved Yellow Eye and the so-called Old Fashioned Yellow Eye. Conversations with growers within the State have revealed the fact that there is a great difference of opinion as to the distinction between these two types of beans. Some growers are inclined to make the distinction upon the shape of the bean without reference to the color pattern,

while others distinguish between them by the color pattern alone. Still others distinguish them by both color pattern and shape. In the following description we shall make the *chief* distinction between these varieties on the color pattern alone. This difference is shown in Figs. 36 and 38. There is also a slight difference in shape between typical strains of these varieties (Figs. 37 and 39). However, the market takes no account of differences in the shape of these two kinds of beans.

As a matter of fact it appears that outside of Maine only one of these types, the Improved Yellow Eye, is grown to any extent. In his work on bean varieties Tracy[2] lists an Improved Yellow Eye but does not mention an Old Fashioned Yellow Eye. He does, however, refer to a Yellow Eye Field bean which in many respects corresponds with the Old Fashioned type.

Improved Yellow Eye.

In regard to the Improved Yellow Eye, Tracy says that it has been listed by seedsmen in this country since about 1880. "The beans are of medium size, proportionately short and roundish in cross section. The ends are either truncate or round. Often the beans are larger at one end than at the other. The eye is either straight or rounded. The color is solid white except brownish ochre around the eye covering about one-fourth the area of the beans."

This description corresponds very well with the type of bean desired in the Boston market under this name. In Figs. 36 and 37 we have illustrated the type of the Improved Yellow Eye which meets with most favor among the bean dealers in Boston. It is proposed to make this bean the standard type of the Improved Yellow Eye for Maine. It is urged that the growers in the State bend their efforts towards the production of beans of this type. We have the assurance of the Boston merchants that beans of this type which fulfill the requirements given in the following paragraphs will receive the highest market price for Yellow Eye beans.

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[2]Tracy, Jr., W. W. American Varieties of Garden Beans. U. S. Dept. of Agr., Bur. of Pl. Ind. Bul. 109, pp. 1-173. 1907.

THE STANDARD TYPE OF THE IMPROVED YELLOW EYE.

There are certain points in regard to these beans upon which the dealers lay great stress and other points to which they pay relatively little attention. In the next few paragraphs it is proposed to point out those characters which the Standard Improved Yellow Eye bean must possess. At the same time will be indicated those characters to which the buyers pay less attention.

Size and Shape. The Improved Yellow Eye bean should be of medium large to large size. Its length should be a little less than $\frac{3}{8}$ of an inch. It must be proportionately broad, giving a plump appearance. Its width should be a little more than half the total length. The typical bean should be rounded at each end. It should have the same thickness at each end, or in other words it should not taper (Cf. Fig. 36). It should be straight at the eye.

Of these characters the one to which the dealers pay most attention is size and plumpness. There is no market for a small bean of this type, nor for a long and narrow bean. Such types should not be grown. Other characters such as shape of the ends and at the eye, etc., are not usually discriminated against. Yet in the interest of uniformity breeders will do well to aim to produce the type given above.

Ground Color. Outside of the "eye" the color should be a clear opaque white without any tinge of yellow. This, next to size and plumpness is the most important character. Beans with a yellowish dirty tinge in the white portion invariably bring less in the market than beans with a good clear white. Such yellowish tinge may result either from the actual presence of creamy pigment in the seed coat, or from a too transparent seed coat which allows the color of the cotyledons to show through. Whatever the cause, anything but a pure opaque white is discriminated against in the market and should be by the grower.

Eye Pattern and Color. The "eye" (i. e., the pigmented portion about the hilum or true eye) should be large and should cover about one-fourth the area of the bean. A bean of the proper shape when viewed from on top should show a very narrow margin of white on all sides of the eye with the possible

exception of the anterior end[3] where the color may extend a little farther towards the lower surface. (Fig. 40 top row). The outer border of the eye should be clear-cut and regular in outline, except that it may be slightly irregular at the posterior end (Fig. 36).

The color should be uniform throughout the eye except the narrow ridge surrounding the hilum and over the caruncle where the color is always darker than elsewhere. The color over the remainder of the eye should be of a medium dark shade as illustrated in Fig. 36.

These are the requirements in pattern and color for the standard Improved Yellow Eye. The two things besides size and plumpness upon which the dealers insist most are (1) that the background should be a clear opaque white and (2) that the eye should be large. It is much better for the eye to be larger than the standard rather than smaller. Considerable laxity is allowed in regard to the shape of the eye pattern and also in regard to spotting. At the present time no discrimination in price is made if the eye pattern is irregular in outline, or if there is a reasonable amount of spotting. There is indeed a certain class of trade in Boston, particularly Italian and Jewish, which prefers a densely spotted bean, like that shown at *a* in Fig. 41. Such a bean however is not an Improved Yellow Eye. This class of trade would no doubt be as well or better satisfied with a solid yellow bean.

In regard to the eye color itself considerable variation will be allowed without discrimination in price. However, the market distinctly prefers a medium dark eye color. Very light shades will not sell readily.

The color must always be clear and bright. In a letter of March 16, 1915, from Chas. H. Stone & Company, of Boston, this concern, which is one of the largest handlers of produce in Boston, says: "A medium dark eye is more desirable than the usual light shade. But the dark color must be clear and

[3]In this paper the following orientation of the bean will be used. The area by which the seed is attached to the pod is the hilum. This side of the bean is the *ventral* and the opposite side the *dorsal*. At one end of the hilum there is a very small depression, the *micropyle*. This end is the anterior. At the opposite end of the hilum is a small raised area, the *caruncle*. This end is the *posterior*.

bright, otherwise the lighter shade, if it is clear and bright, will be preferred. That is to say, the brightness of color is of more importance than the shade."

To sum up, the chief requirements of an Improved Yellow Eye bean are: that it must be relatively large and of sufficient depth of color to contrast strongly against the clear opaque white background.

In Fig. 40 are shown some of the variation from the standard type of Improved Yellow Eye against which there is at the present time no discrimination in the market. In Fig. 41 are shown a few of the types which the dealers do not want and which on the average will not bring the best prices.

One other point should be mentioned in connection with these beans. This is the uniformity of the product not only of each grower but of each community or better of the State as a whole. It is obvious that in order to secure fancy prices a man must not only have *some* beans of the standard type, but he must have them *all* of that type. The more nearly uniform and true to type the better price one can expect for his crop. When it becomes known that a community is producing a standard uniform type of bean, the dealers will be willing to pay a better price for the product.

Of the various types of Yellow Eye beans the Improved, or as it is sometimes called the Boston Yellow Eye, is by far the best seller in the Boston market. There is more demand for this bean than for any other type of Yellow Eye. Consequently growers of this variety are always assured of a ready market for their crop.

According to our experience the type of Improved Yellow Eye described above is of the short runner type of plant. Under ordinary conditions the runners are from 2 to 3 feet long. Where the beans are grown in a field by themselves this is an advantage in that it gives opportunity for a larger yield. Where beans are grown in with corn, however, this is a disadvantage, since in harvesting the beans the corn is likely to be injured. One of the objects of the Station's breeding work is to produce a good yielding standard Improved Yellow Eye of the bush type.

Old Fashioned Yellow Eye.

As mentioned above, Tracy[1] describes a "Yellow Eye Field" bean which corresponds very well with what is generally known in this State as the Old Fashioned Yellow Eye. Of this bean Tracy says that it is a very old variety listed by seedmen at least since 1874. It was formerly much more grown than now. It is distinct from and of about the same usefulness as the Improved Yellow Eye. It resembles this latter variety more than any other, but has narrower, flatter seeds with a smaller area of yellow. He further says that the eye is of "about the same color and shape as the Golden Eyed Wax" of which he gives a figure.

From the information gathered by us it appears that this Old Fashioned Yellow Eye was formerly grown much more extensively in this State than at present. On the other hand, one gains the idea throughout the State that the Old Fashioned type is again becoming more popular. Whether it is really more widely grown than a few years ago, it is difficult to say.

Boston bean merchants in general say that outside of Maine there is practically no demand for the Old Fashioned type of bean. They tell us that when they receive a lot of these beans (most of which are grown in Maine) they are largely sent to jobbers and retailers in Maine for sale within this State. Under such conditions there is not the same wide market for the Old Fashioned Yellow Eye that there is for the improved type.

The only exception to this statement which we have been able to learn of is contained in a letter from Chas. H. Stone & Company, Produce Commission Merchants, 9 Chatham Row, Boston. They say: "Our experience, however, is a little different from that which you found in that we have always been able to get a better price for the old fashioned Yellow Eye than we have for the improved type."

"You speak of the "improved" as by far the best seller in the Boston market. This, as we said before, has not been our experience, but possibly it may have been with other dealers. Also you speak of there being no demand for old fashioned Yellow Eyes outside of Maine. While there is always a demand for the old fashioned in Maine we have found a good

[1] *Loc. cit.*

sale for them in Massachusetts and should certainly not discriminate against the old fashioned "Yellow Eye."

Regarding these statements our only comments would be, first, that they are not in accord with what other large dealers in Boston have told us, and, second, that under these circumstances, it would seem that the Maine grower who has some Old Fashioned Yellow Eyes to dispose of beyond what his local market will absorb would perhaps do well to send them to Chas. E. Stone & Company, as they, on their own statement, have a good market for them.

Maine consumes annually large quantities of beans. At the present time it would appear that our consumption must nearly if not quite equal our production of this crop. So long as the demand for Old Fashioned Yellow Eyes continues within the State there is not much danger of the supply exceeding the demand. However, it is believed that large growers will find it more advantageous to confine their attention to the Improved Yellow Eye. On account of its wider market the producer will on the average have a much better opportunity to dispose of his crop to advantage.

It is not at all difficult to find large numbers of people within the State who claim that the Old Fashioned Yellow Eye bakes much better and has a better flavor than other types of beans. No doubt an equal or greater number of people could be found to claim the same for the Improved Yellow Eye. It is extremely improbable that either baking quality or flavor is closely associated with the shape of the color spots on the bean. Different strains of each variety no doubt differ in quality but undoubtedly equally good strains exist in each. This market preference is in the same class with that for brown or white shelled eggs. So long as the consumer gets satisfaction from such differences, whether real or imaginary, it is the business of the growers to produce them in accordance with the demand.

THE STANDARD TYPE OF THE OLD FASHIONED YELLOW EYE.

In the following paragraphs we have attempted to describe the standard for Old Fashioned Yellow Eye beans which most nearly meets the demands of the dealers and growers within the State and which also is in agreement with the ideals of the Boston merchants. This standard type is illustrated in Figs.

38 and 39. In addition to the description of this type we shall indicate some of the variations in type, pointing out especially those for which there is no general market.

Size and Shape. To meet the present market conditions the Old Fashioned Yellow Eye like the Improved must be of medium large size and of plump appearance. It must be emphasized again that there is no market for a small or slender *colored* bean for baking purposes. The typical Old Fashioned Yellow Eye is slightly smaller than the typical Improved. This difference, however, is of little importance since both must give the appearance of large plump beans.

In shape the typical Old Fashioned Yellow Eye is slightly more flattened laterally than the Improved. Instead of being of equal thickness at each end the Old Fashioned tapers towards the anterior end.[8] The posterior end is round and full. The anterior end is slightly truncated giving the appearance of a diagonal cut. (Fig. 39). The ventral or eye side should be nearly straight. The dorsal side (opposite the eye) should be rounded and taper towards the anterior end as shown in Fig. 39.

While the above description is taken as typical of the variety, any commercial lot of Old Fashioned Yellow Eyes will contain many other shapes. Some of these variations in shape are shown in Fig. 44.

The market-men do not make distinctions between different shapes. Their only requirement is that the beans shall be large and plump. They distinguish between Old Fashioned and Improved Yellow Eyes entirely on the eye pattern.

Ground Color. The ground color of the Old Fashioned Yellow Eye bean must be a clear opaque white. A yellowish tinge means a lower price. All that was said regarding this character in the Improved Yellow Eye applies with equal force to the Old Fashioned type.

Eye Pattern and Color. A typical Old Fashioned Yellow Eye pattern is shown in Fig. 38. Some of the variations of this pattern are shown in Figs. 42 and 43. The typical pattern will be discussed first.

The Old Fashioned Yellow Eye pattern consists typically of three color areas or color centers. The first of these is a

[8]For explanation of these terms see foot-note on p. 168.

rather narrow stripe of pigment extending anteriorly from just in front of the micropyle to the apex of the bean. The second color area is that surrounding the micropyle and extending in the form of a horse-shoe around the anterior end of the hilum. This color area may or may not unite with the anterior stripe (cf. Figs. 42 and 43). The third color area is much larger than either of the others and much more variable in form. It covers the caruncle at the posterior end of the hilum and extends at least part way around the posterior end of the hilum. This pigment area may or may not meet the horse-shoe band from the second pigment area. If it does there is formed a narrow band of dark pigment surrounding the hilum (hilum ring). This third pigment area extends posteriorly almost but not quite to the posterior edge of the bean. In some cases the posterior edge of this area is forked or slightly irregular. Starting immediately behind the caruncle two rather broad wings extend forward along the sides of the hilum. These wings should extend forward to the level of the micropyle. These wings should not unite with the color area surrounding the micropyle. The colored area should be sharply defined with few irregularities. The pattern should be symmetrical on the two sides and there should be no spots outside the pattern.

The color of the eye should be medium dark as shown in Fig. 38. The color should be of even intensity over the whole of the pattern except in a narrow band around the hilum and in the region of the micropyle and over the caruncle. These areas have a much darker and browner pigment than the remainder of the pattern. The market requirements in regard to color are not strict. Any shade of brownish yellow pigment will be accepted provided it is not too light. As in the case of the Improved Yellow Eye the color must be deep enough to contrast with the white background. Light and faded appearing colors will not bring the best prices. Brightness of color is, however, always more important than the exact shade (cf. p. 168).

In regard to the color pattern itself there is an almost infinite number of variations from the type described above.

A number of these are shown in Figs. 42 and 43.[6] With few exceptions any of the variations in Fig. 42 would be accepted on the market as Old Fashioned Yellow Eyes. Beans in which the colored area is too small, as some of those in rows 1 and 2 of Fig. 42, would not bring the best price. Against the remaining beans, there would probably be no discrimination in price. However, in the interests of uniformity of type, breeders will find it to their advantage to approach as nearly as possible to the standard described above.

As indicated in these paragraphs, the only points in regard to the color pattern to which the dealers seriously object are (1) too small an eye pattern, (2) too pale a color, and (3) dullness of color. If a bean is to be eyed at all, the eye must be large enough and distinct enough to form a good contrast. These points together with the whiteness of the background and the large plump appearance of the seed are the things to be clearly kept in mind.

One other point should be mentioned in connection with these beans. There has several times appeared upon the market and in the seed shows of the State a variety of beans similar to those shown in Fig. 44. These beans are entirely white except for a dot of color at each end of the hilum. These beans have been listed in the past under the name "Old Fashioned Yellow Eye." Now they are usually listed as "Imperial Yellow Eye." In our study of this matter we have been unable to find any justification for including these "dot eyes" or Imperials in the Old Fashioned Yellow Eye class. We are further informed that in the large markets there is absolutely no demand for such beans. We, therefore, strongly recommend that growers who expect to sell their crop outside of purely local communities should *not* grow this type.

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[6]These two figures are taken from an unpublished thesis in the University of Maine library entitled "Variation in the Seeds of the Old Fashioned Yellow Eye Bean" by Mr. C. W. Barber.

Comments of Leading Boston Dealers in Beans on the Standards here Proposed.

As has been pointed out earlier, the standards for yellow eye beans herein set forth have been submitted to leading market men in Boston.[1] Some of their comments follow:

Chas. H. Stone & Company, 8 Chatham Row, Boston, say: "We have been much interested in reading this report and with one or two minor exceptions we heartily agree with all you have said and believe it will be of great benefit to the bean growers here in Maine or any other state."

Mr. O. H. Dodds, the bean expert of the Thomas W. Emerson Company, 74-76 So. Market St., Boston, says under date of March 13, 1915: "Your treatise on Yellow Eye Bean breeding which was kindly left here for me to read, with request to offer what criticism I might see fit to make, I have carefully perused, and I fail to see where I can make any criticism. You seem to have covered the ground very thoroughly.

"Would say that there are only two kinds of Yellow Eye Beans which find a ready market here. One is the plump type of the Old-Fashioned Yellow Eye, and the large plump type of the Improved Yellow Eye. If the beans come anywhere near these two types they find a ready market here in Massachusetts, and also in Maine.

"Of course, it is plain to be seen that the sooner farmers come up to these ideals, they will have a better produce and receive a better price for same."

Mr. J. W. White, the bean expert of the Fowle, Hibbard Company, 173 State St., Boston, says: "We have been over the manuscript that was left with us and it will be presumptive on our part to add anything to the very clear and exhaustive treatise that you have made on the subject. The two types of Y. E. Beans we should consider almost perfect and if you can induce your farmers to use that kind of seed we believe we shall have a much better type of beans."

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[1]It is a great pleasure to acknowledge our indebtedness and to express our thanks to Mr. Robert H. Gardiner of Boston, formerly a member of the Council of the Maine Agricultural Experiment Station, for aiding us in getting in touch with the principal bean men in Boston.

Description of Figures.

Fig. 36. Standard type of Improved Yellow Eye Bean. Ventral view.

Fig. 37. Standard type of Improved Yellow Eye Bean. Side view.

Fig. 38. Standard type of Old Fashioned Yellow Eye Bean. Ventral view.

Fig. 39. Standard type of Old Fashioned Yellow Eye Bean. Side view.

Fig. 40. Showing some of the variations in typical Improved Yellow Eye beans. These beans are all of marketable types.

Fig. 41. Showing some of the undesirable types of Improved Yellow Eye beans. These beans are either too small or too slender or show too small and too irregular an eye pattern.

Fig. 42. Showing some of the variations in Old Fashioned Yellow Eye beans. Most of these beans are not of the ideal type but with few exceptions they would not be discriminated against in the market. (After Barber).

Fig. 43. Showing some of the variations in shape of the Old Fashioned Yellow Eye beans. (After Barber).

Fig. 44. Showing some variations in "Dot-eye" beans. These are not Old Fashioned Yellow Eye beans, and outside of a few purely local markets there is no sale for these beans. (After Barber).

FIG. 36. Standard type of Improved Yellow Eye Bean. Ventral view.

FIG. 37. Standard type of Improved Yellow Eye Bean. Side view.

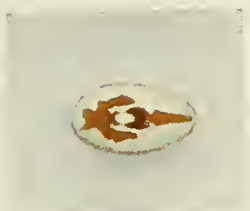

FIG. 38. Standard type of Old Fashioned Yellow Eye Bean. Ventral view.

FIG. 39. Standard type of Old Fashioned Yellow Eye Bean. Side view.

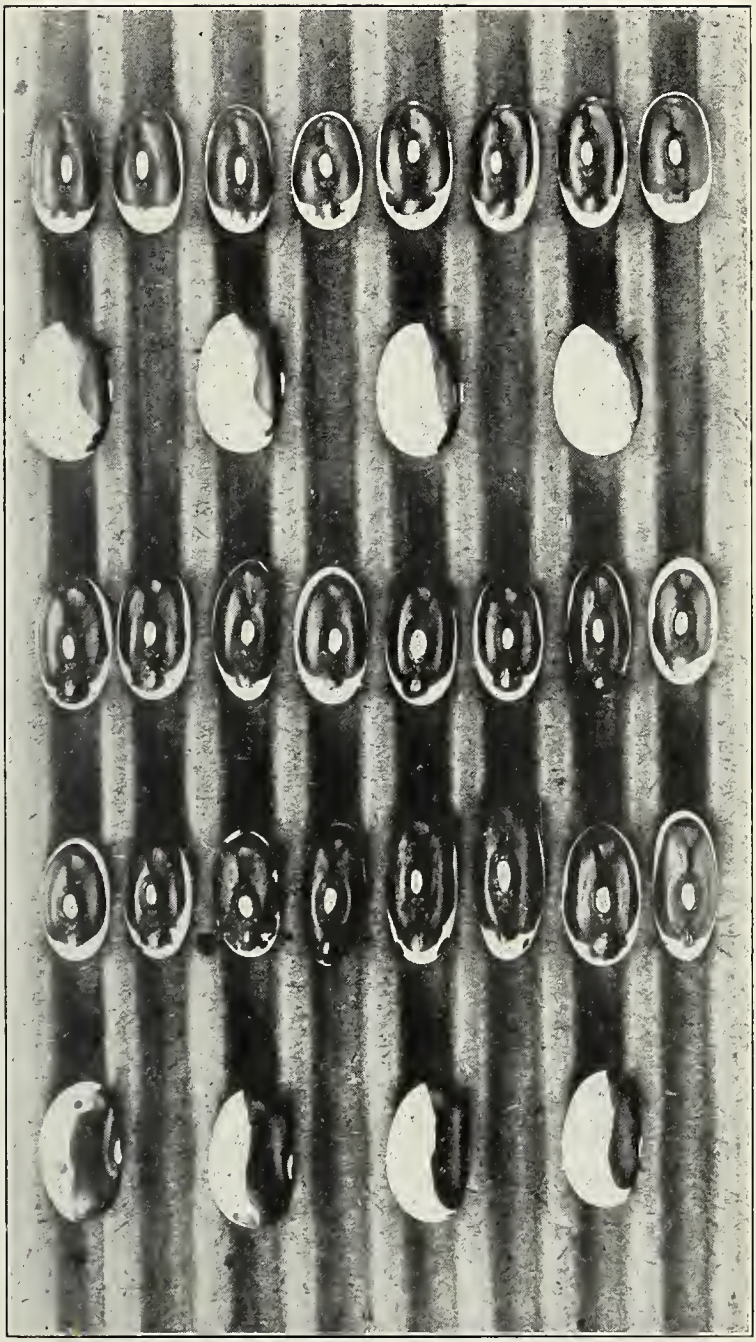

FIG. 40. Showing some of the variations in typical Improved Yellow Eye beans. These beans are all of marketable types.

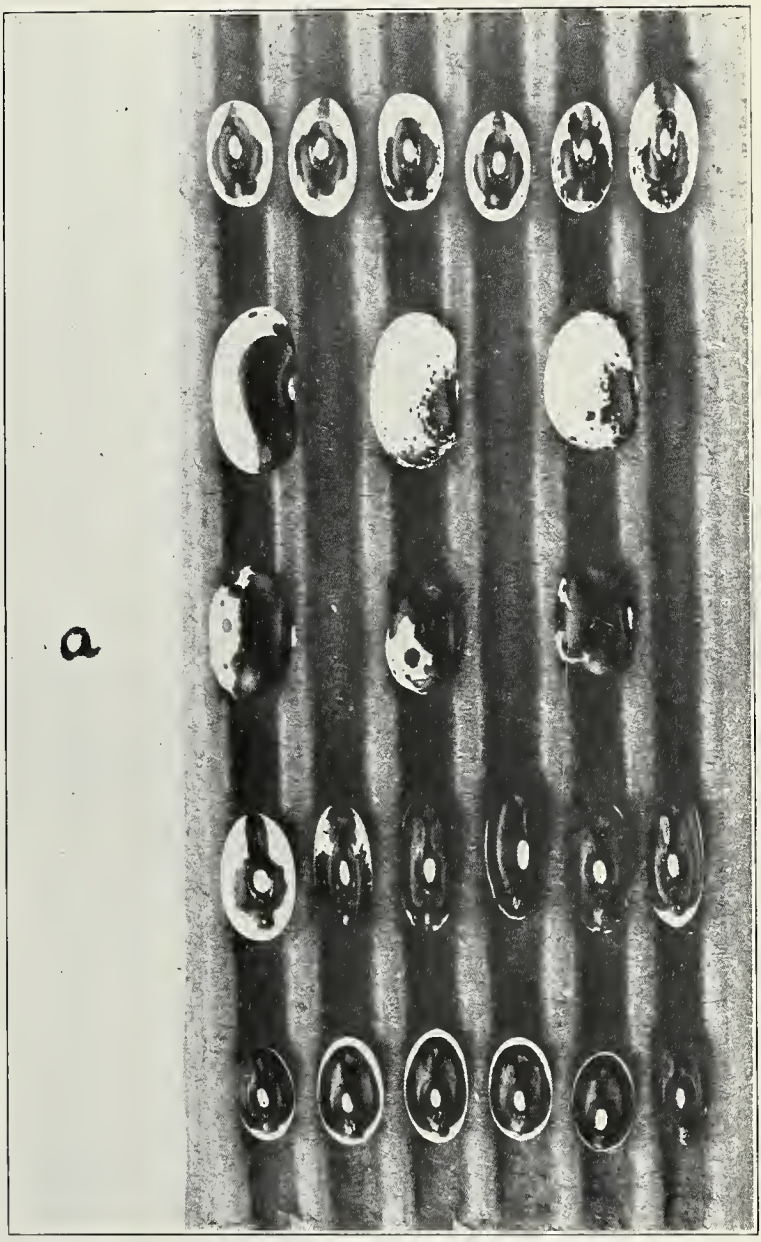

FIG. 41. Showing some of the undesirable types of Improved Yellow Eye beans. These beans are either too small or too slender or show too small and too irregular an eye pattern.

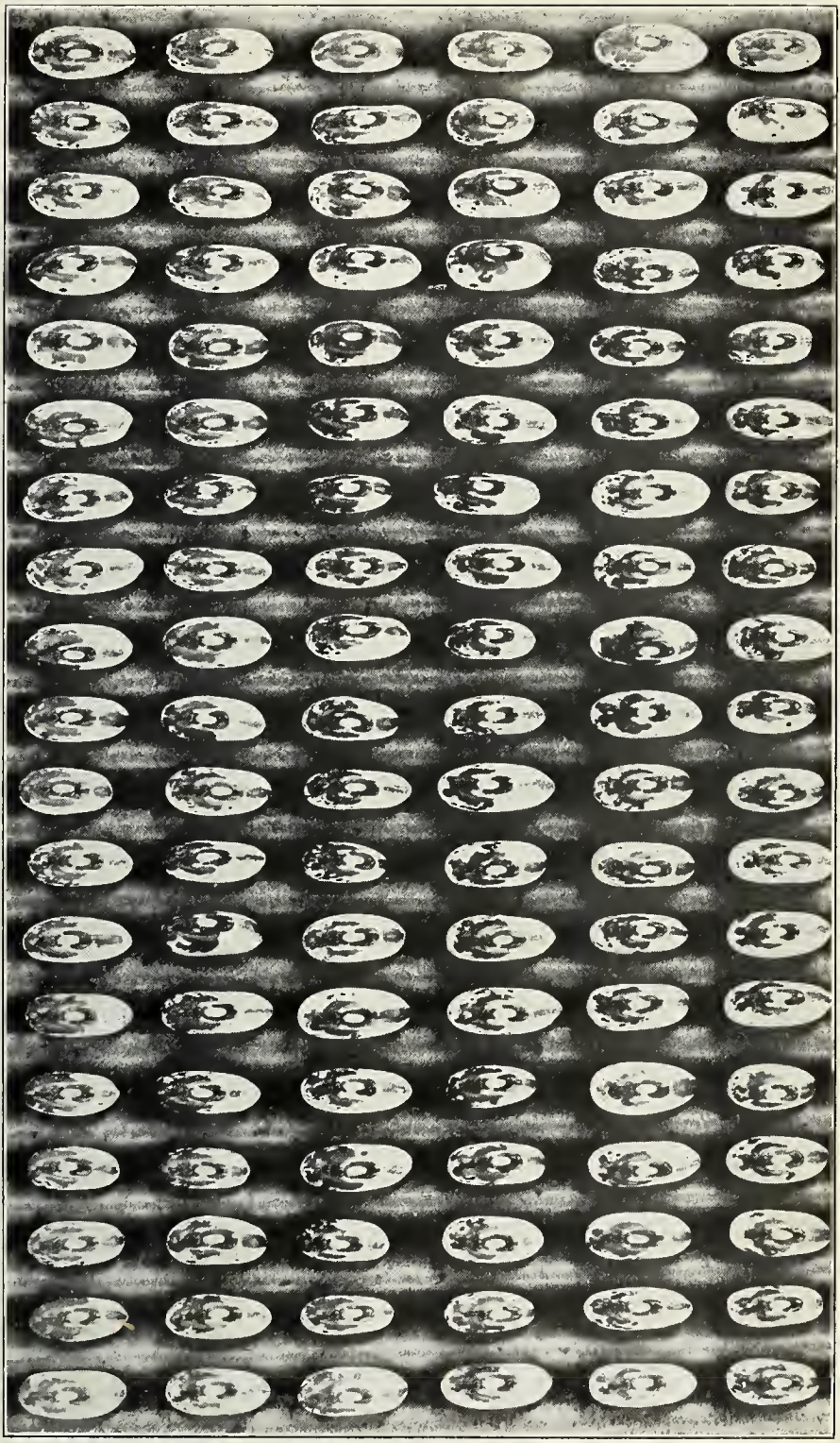

FIG. 42.

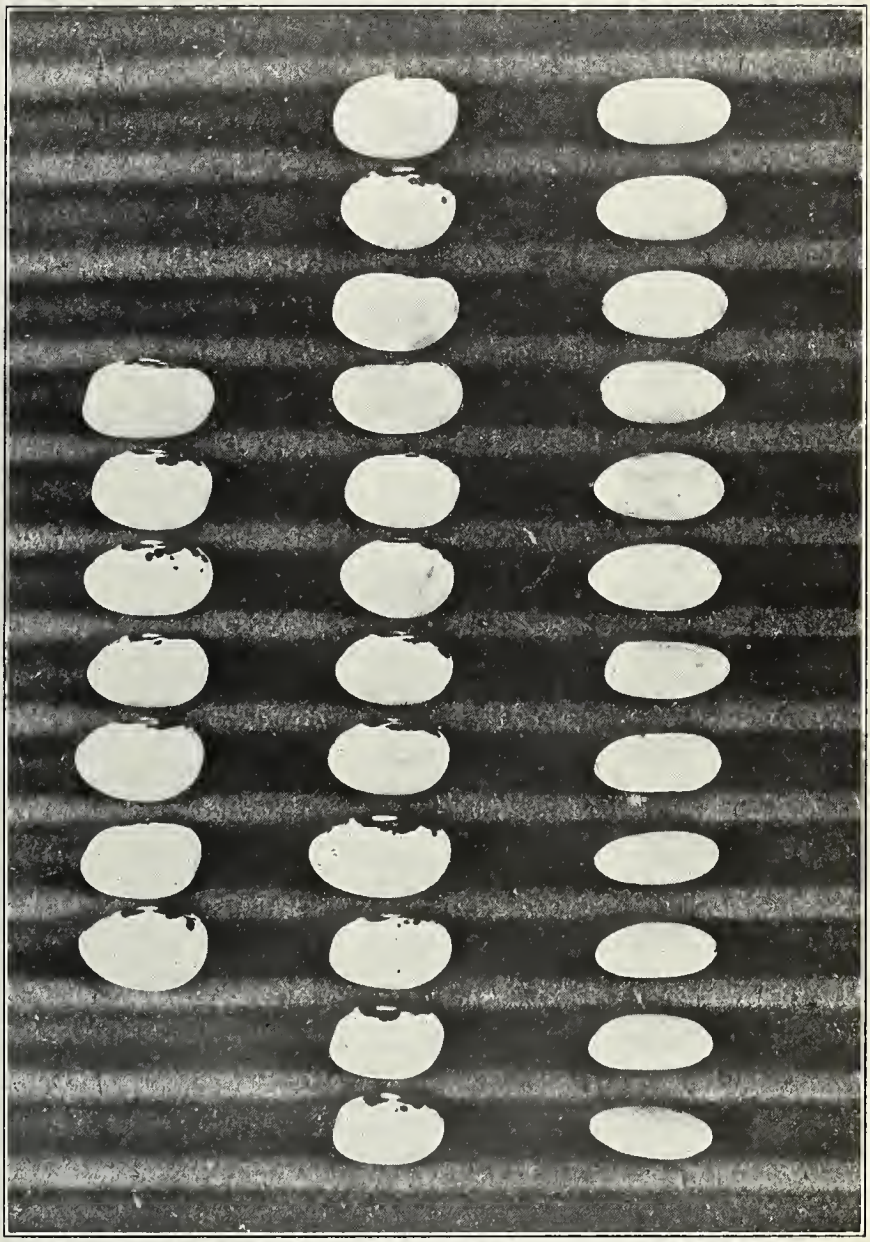

FIG. 43. Showing some of the variations in shape of the Old Fashioned Yellow Eye beans. (After Barber.)

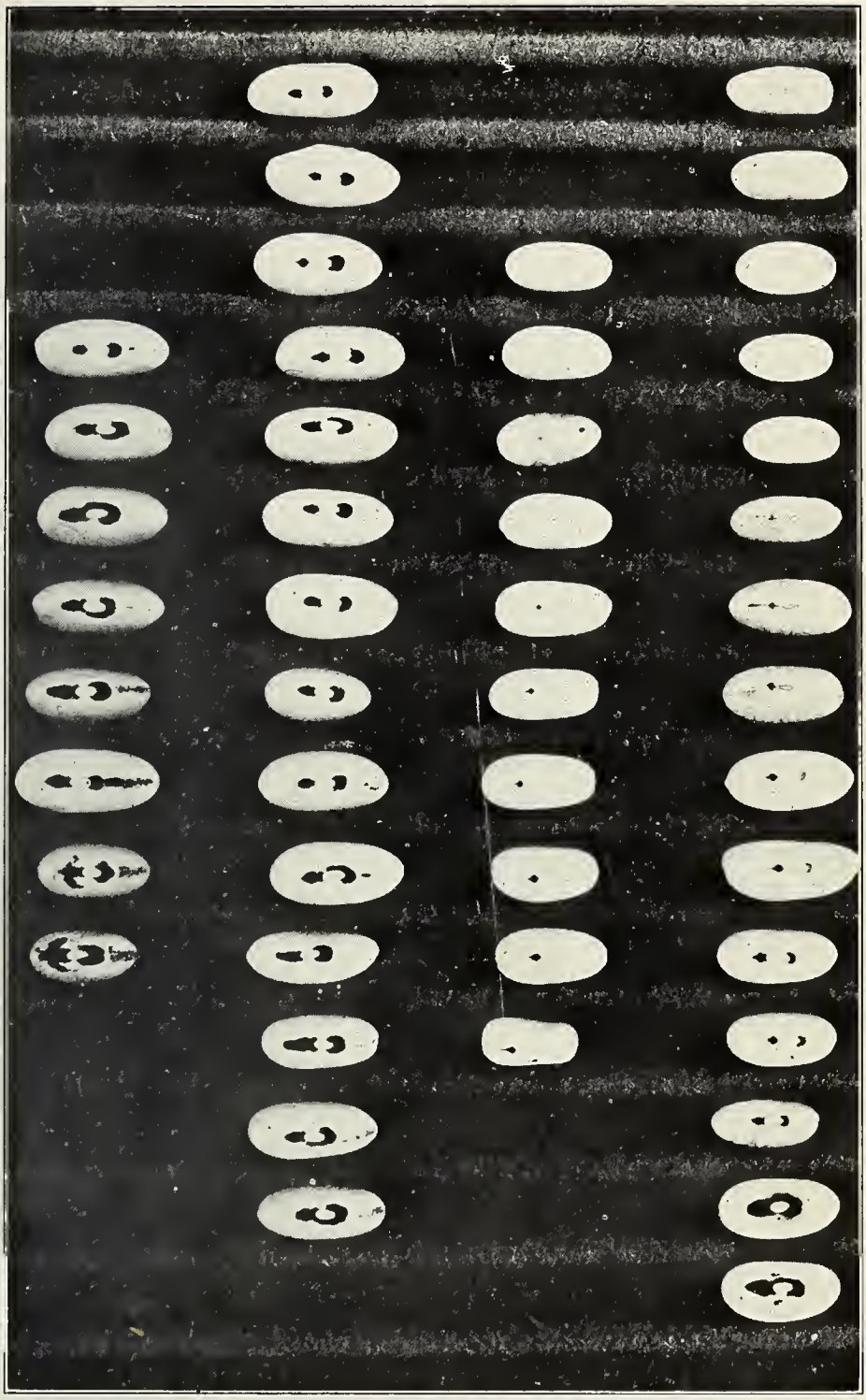

FIG. 44. Showing some variations in "Dot-eye" beans. These are not Old Fashioned Yellow Eye beans, and outside of a few purely local markets there is no sale for these beans. (After Barber.)